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EXPANSION OF PHRASE STRUCTURE RULES AND SINGLE-BASE TRANSFORMATIONS--LANGUAGE CURRICULUM II, STUDENT VERSION.

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A MANUAL WAS PREPARED FOR STUDENT USE IN AN EIGHTH-GRADE LANGUAGE CURRICULUM. THE MANUAL WAS A STUDY GUIDE CONCERNED WITH ADDITIONAL PHRASE STRUCTURE RULES AND SINGLE-BASE TRANSFORMATIONS. GUIDES FOR INSTRUCTION ON 18 PHRASE STRUCTURE RULES WERE PREVIOUSLY REPORTED (ED 010 151). THE MANUAL WAS KEYED TO A MANUAL FOR TEACHERS (ED 010 154) AND PROVIDED EXPLANATIONS, DIAGRAMS AND EXAMPLES FOR STUDENT EXERCISES. (WN)

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OREGON CURRICULUM STUDY CENTER

EXPANSION OF PHRASE STRUCTURE RULES AND SINGLE-BASE TRANSFORMATIONS

Language Curriculum II
Student Version

The project reported herein was supported through the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

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EXPANSION OF PHRASE STRUCTURE RULES

THE ADVERB OF PLACE

When we began our study of phrase structure rules, we analyzed very simple sentences. At first we concentrated on the most essential parts and included very few optional elements. You will recall that optional rules are always surrounded by parentheses; for example, (have + en) indicates that the sentence may contain have used as an auxiliary or it may not.

Look at the following sentences and try to determine which parts are optional parts, that is parts which are not essential.

1. The train is coming.
2. Junior has lost the key.
3. Mr. Jimson understands slowly.
4. The wind is quiet.
5. We will be late.
6. The movie costs a dollar.
7. The catcher must have dropped the ball.
8. The townspeople had hanged the rustler.
9. Ensign Duffle was planning the mutiny.
10. The butler could have been here.

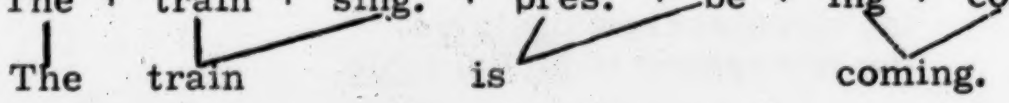
If you check your phrase structure rules for all the optional elements we have studied, you will find that these sentences include:

(have + en) as in sentences 2, 7, 8, and 10.
(be + ing) as in sentences 1 and 9.
(M) or modal as in sentences 5, 7, and 10.
and (Man) or manner adverb as in sentence 3.

Exercise 1:

A. Construct sentence strings for the ten sentences above and show how they are related to the sentences.

Example: The + train + sing. + pres. + be + ing + come.



B. Construct the symbol strings which represent the following sentences:

1. The air had become smoky.
2. The Hayworths are planning a party.
3. Leprechauns must have been here.
4. Everyone should have brought boots.
5. The dough will rise quickly.
6. This drum can hold the chemicals.
7. Willie was angry.
8. The album should have had a title.
9. The marshmallow had stayed soft.
10. People might be growing impatient.

If you look at very many sentences you will soon realize that there are many elements which are not accounted for in the phrase structure rules which you have written so far. In this section we will be looking for some of these elements and learning how to adapt the phrase structure rules to take care of them.

Exercise 2.
Try to make branching diagrams for the following sentences:

1. **The design was ornate.**
2. **Ice melted around the edges.**
3. **Mount Etna smoked in the distance.**
4. **The newspaper is upstairs.**
5. **The story ended abruptly.**
6. **You may putter in the basement.**
7. **The fighter weighs 198 pounds.**
8. **Mother will make the salad in the kitchen.**
9. **Green must be your color.**

Were there any elements that you couldn't identify with the phrase structure rules which you have learned so far? List them. What question do these elements answer? Would you say they are optional?

Such elements are called adverbs of place or location. Perhaps you remember that we talked about such elements in Rule (11) which said that one kind of Pr is an adverb of location. We used the symbol Loc to stand for such elements and we will extend the use of this symbol to apply to such adverbs wherever we find them. Check your lexicon under Loc to find other examples, and when you come across examples you don't have, add them to your lexicon. Notice that place adverbs, like time and manner adverbs, can be a phrase as well as a single word:

the newspaper is upstairs.
the newspaper is on the table.

Is it possible to use Loc adverbs with all kinds of verbs? The following exercises should help you find the answer to this question.

Exercise 2:
Write down the verbs in the following sentences and indicate what kind of verb each is. If there is a place adverb present, list it also.

Example: Ferdinand sat under the cork tree.

Verb	Kind	Loc.
sat	Vin	under the cork tree

1. **The boy is a tyrant at home.**
2. **The bell sounds loud here.**
3. **Houses have cyclone cellars in Kansas.**

4. John found the money at the pool.
5. The firecracker exploded in the closet.
6. The child was sleeping on the floor.
7. The dog gnawed the bone outside.
8. A tent costs ninety-eight dollars at Sears.
9. Jenny seemed happy at school.
10. Max is the boss in his building.

What type of verbs would you say Loc can be used with?

If Loc can be an optional element with all kinds of verbs, where should it be placed in the rules? Earlier when we discovered the manner adverb (Man), we found that it occurs with both transitive and intransitive verbs which are part of V. Therefore we added it to the diagram with V (Rule 9).

We find that the new element Loc can accompany all of the verb classes. Therefore it must be placed in the branching diagram at the part where Aux and Verb branch off from VP, that is in Rule (2). This will be a new version of Rule 2.

It is not a new rule but a more inclusive version of the 2nd rule. We will put Loc in parentheses to show it is optional. In what way is this loc different from the Loc which is a Pr? Is the Loc which is a Pr an optional element?

Rule (2)	VP ---→	Aux + Verb (Loc)

Why isn't it necessary to put (Loc) after each of our five classes? In order to answer that question we need to remember what the symbol Verb means.

Exercise 3:
Copy the following sentences, underline the adverbials and indicate what kind they are.

Man Loc
Example: The car ran perfectly in the garage.

1. Joan played ball happily in the yard.
2. She will live in the apartment.
3. The moon is rising there.
4. The packages arrived here
5. The poodle sat perkily outside.
6. The fog settled ominously on the harbor.
7. Harriet will shop downtown.
8. The salmon slithered upstream.
9. The children ran races in the meadow.
10. Roosevelt became ill in Florida.

Exercise 4
Create kernel sentences which include the following elements:

1. **Aux_2 + Vtr + NP + Man**
2. **Vlnk + Pr +** Loc
3. **Aux_2 + Be + Pr +** Loc
4. **Aux_2 + Vin +** Loc
5. **Vmid + NP +** Loc
6. **Aux_2 + Vin + Man +** Loc
7. **Vtr + NP +** Loc
8. **Be +** Loc
9. **Vlnk + Pr +** Loc
10. **Aux_2 + Vtr + NP + Man +** Loc

To remember:

1. The locative adverb is an optional element which can occur with any verb.
2. It answers the question <u>where</u>.
3. It differs from the locative which is a predicate in being optional.
4. It may be either a single word or a group of words.

THE ADVERB OF TIME

We have rewritten Rule (2) to include the optional element Loc. Loc stands for locative adverb which is an element answering the question Where? In the following sentences can you find another element which is not accounted for in the rules? How would you describe it? Would you say it is optional?

Exercise 1:

1. The fish were biting yesterday.
2. Fred has been grumpy this morning.
3. Montmorency must have skipped school last week.
4. You should check the battery daily.
5. Mantle will be batting next.
6. Miss Forbush has a headache tonight.
7. The cornflakes have been soggy this winter.
8. The Pacific Ocean might have looked rough a week ago.
9. Some girls are washing cars before breakfast.
10. The group will meet tomorrow.

What do the new elements in these sentences have in common? What question do they answer?

We will call the new part the time adverbial, using the symbol (Tm) to represent it. Can it be used with the verb Be? Vlnk? Vmid? Vtr? Vin? Where should it be added to the diagram? Perhaps the following exercise will help you answer these questions.

Exercise 2:
Look again at the ten sentences above, identify the verb class, and attach the new symbol where it is needed.

Vin Tm
Example: The fish were biting yesterday.

We wrote a new version of Rule (2) to indicate that the Loc adverb could be used with all verbs, Now we see that Tm can also be used with all verbs and we need to add this information to Rule 2. How shall we indicate that Tm is optional? Write the rule which will indicate that VP includes not only Aux and Verb but also that it may optionally include Tm and Loc.

Rule (2b) VP---→ Aux + Verb (Loc) (Tm)

Notice that the time adverbial usually comes last in a string even when other adverbs are present. We don't usually say *"The flowers are growing this spring rapidly."

Exercise 3:
Write the symbol strings for the following sentences.

A. 1. **He passed the course easily last year.**
2. **Joseph did his work carefully all year.**
3. **Mother would have called frantically by then.**
4. **Huck floated cheerfully down the river.**
5. **The flowers are growing rapidly this spring.**
6. **The boat floated down the river last night.**
7. **Ann found the ring in the drain this morning.**
8. **Bears sleep in caves in the winter.**

B. 1. **The astronaut will go to the moon.**
2. **He found the ball under the fence.**
3. **The men have been working industriously in the field.**
4. **Ned has been sitting at the typewriter all night.**
5. **The superintendent will be speaking at our school soon.**
6. **An alligator thrashed the water noisily in the bathtub.**
7. **The surfboard floated in the trough.**
8. **The battle raged on the hill all day.**

To remember:

1. The time adverbial is an optional element which answers the questions <u>when</u>.

2. It may appear with any verb.

3. It usually occurs last when it appears with other adverbs.

ACTIVE AND STATIC LINKING VERBS

The first time the five verb classes were introduced, we learned that each was different from the others in rather important ways. To some extent our approach was like that of the players of the game "20 questions": In order to reduce the number of possible answers quickly, the questioner asks about general facts, such as whether the item in question is animal, vegetable, or mineral. When we defined the linking verb, for example, as a verb other than Be which takes a predicate (Pr), we were giving it a very general classification (like animal, vegetable, and mineral) which can be further divided into more specific parts. Before we look to see how the linking verb might be divided, we need to review the predicate. The three kinds of Pr are represented in these sentences.

1. **Pear blossoms smell** musty. **(Adj)**
2. **The cougar remained** outside. **(Loc)**
3. **Tim became a** shortstop. **(NP)**

Exercise: 1.
List the Vlnk + Pr in the following sentences and indicate the kind of Pr.

Example: **Vlnk + Pr**

The weather turned hot. **turned + hot (Adj.)**

1. **Roger** seems happy.
2. **These pancakes smell good.**
3. **Horatio appeared unconcerned.**
4. **Miss Fitts will remain the secretary.**
5. **The dog must have gone mad.**
6. **The slope looked unclimbable.**
7. **Some luggage should remain behind.**
8. **The forests have been getting dry.**
9. **This cola tastes flat.**
10. **His hobby has become his vocation.**

Look once more at the sentences above.
Try to ask the question "in what manner?" about each and think of an answer. Are there some for which such a question and answer are not possible? That is, are there some which will not take a manner adverb?
Now list the linking verbs from the sentences to which you were able to add the manner adverb.

In another column list the linking verbs from the sentences to which you could not add the manner adverb.

You have now shown the difference between two subclasses of linking verbs, those that successfully take a manner adverb, and those that do not. We will use the term active **to identify Vlnk which can take the manner adverb and** static **to identify those that cannot. The symbols will be Vl st and Vlac. Now can you write a rule that shows that a linking verb may be one of two subclasses and that if it**

is Vlac it will take a manner adverb?

(Remember that our previous rule dealing with linking verbs was Rule 8. This is not a new version of rule 8, but an addition to it. When we add a rule to one we have previously written we will use the original rule number but will place a period after it and then a number to indicate that we have added a sub rule. Thus our new rule in this case, will be an expansion of an item in Rule 8. It will be Rule (8.1)

Rule 8.1 Vlnk ---> { Vl ac (Man) / Vl st }

What other verbs have we found which take manner adverbs?

Exercise 2:
A. List the Vlnk in the following sentences and indicate if they are Vlst or Vlac.

1. The Manx became wild quickly.
2. A dogfish remained in the pool.
3. The cherries taste delicious.
4. The cat will get angry quickly.
5. Cactus grows tall in the desert.
6. The surf sounds noisy tonight.
7. Freddy has appeared dishonest.
8. The fur felt rough on her face.
9. A star seemed very close.
10. The coach is going crazy.

B. Rewrite the ten sentences on page 7 so that each Vl ac is replaced by Vl st and each Vl st is replaced by Vl ac.

Example: The boy appears tall. (Vl st)
The boy grew tall. (Vl ac)

C. Add Vl ac and Vl st to your lexicon and list some appropriate linking verbs after each.

THE ADVERB OF DIRECTION (DIR)

Our new Rule (2) predicates that all verb phrases may include locative or place adverbs which answer the question where. We used the symbol loc for such elements and found that they may be either single words or phrases. (here, there, on top, under the table, etc. Check your lexicon for others.)

Exercise 1:
Find and list the loc adverbs in the following sentences.

1. It rains often on the coast.
2. The twins are at home.
3. The one-eyed cat was sitting under the eaves.
4. The hippopotamus wallowed in the pool.
5. The truck drivers usually eat in this cafeteria.
6. An airport was built on the island.
7. The dancer wasn't there.
8. I left your lunch right here.
9. The oriole built a nest in the plum tree.
10. The student was sleeping in the broom closet.

Exercise 1a:
In the following groups of sentences find the adverbs which answer the question where. List those from the first group in one column and those from the second group in another column.

A.
1. He is lying under the bed.
2. The big typewriter sits on the table.
3. Butterflies gathered around the flowers.
4. The riders will be gathering in the corral.
5. The neighborhood children have been playing in the yard.
6. Nero fiddled in Rome.
7. The car stopped on the freeway.
8. He will lecture in the ballroom.
9. The hobo had been standing on the back porch.
10. Coconuts grow in the tropics.

B.
1. I was going to St. Ives.
2. The class traveled by bus to New York.
3. The python has crawled away.
4. The player ran quickly to the goal post.
5. The carnival is moving to the next town.
6. The child tumbled into bed.
7. The pudding fell onto the floor.
8. The conductor glanced toward the depot.
9. He climbed to the top.
10. He lunged at the bear.

Can you find a difference between the kind of where question which is answered by the place adverbs in the first group and the kind which is answered by elements in the second group?

Try to say what the difference is.

What kind of verbs do you find in all of the sentences in the two groups?

If they are all the same kind of verb, is there any difference between those in the first group and those in the second?

Try to define any difference you may find.

We can say that the adverbs in the first group answer the question where? meaning in or at what location. We have called such adverbs locative adverbs (loc) in Rule (2b). The adverbs in the second group above answer the question where meaning to what location. We will call this particular kind of where adverb the adverb of direction and will use the linguistic symbol Dir when referring to it.

Can the directional adverbs **which you listed for Group B above be used with the intransitive verbs in Group A?**

Can those in Group A be used in Group B?

There is a certain kind of intransitive verb, then, which takes a directional adverb. **If we use the symbol** Vid **to stand for this special class of intransitive verbs and** Vi **to stand for all other intransitives, we can write a rule which breaks down the classification of** Vin. **This will be an** expansion of an item in Rule (10).

This is our first expansion of (10) **so we will number it 10.1. In it we want to show that there is a special class of intransitive verbs which may have** Dir **attached to them.**

Rule (10.1) Vin ---> { Vi ; Vid (Dir) }

Although we say that Loc **answers the question at what location and** Dir **answers the question to what location, you should notice that the prepositions at and to are misleading.**

The hawk dived at the chickens. (Vid + Dir)
He is sitting to your right. (Vi + Loc)

Exercise 2a
Write ten sentences of your own in which you use Vi + Loc **and** Vid + Dir **Indicate which you use in each sentence.**

Review Exercise:
Generate the following sentences using branching diagrams.

A. 1. The bandits were waiting in the gulch.
2. The delegates will be going to the auditorium.

3. Charles had the measles last week.
4. The verdict must have been acceptable.
5. The room has remained empty.
6. Trilby had been singing beautifully.
7. Farmers will be threshing grain tomorrow.
8. The boys are hiking toward Death Valley.
9. Her coat should be hanging on the clothesline.
10. Shirley might have glanced through the window.

B. 1. The sun was sinking slowly into the river.
2. George has been biting his nails lately.
3. The lady must have had a headache.
4. Storms could be causing the interference.
5. Water had been trickling into the basement.
6. The airplane bounced on the runway.
7. Her smile will brighten the scene.
8. The kitchen has become warm gradually.
9. The lecture must have seemed long.
10. Bob tore his shirt at camp yesterday.

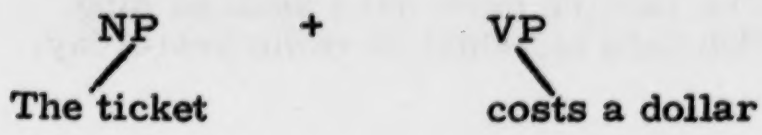
From Phrase Structure to Transformation

In the phrase structure rules we learned to analyze the parts of a kernel sentence. And we said kernel sentences were the basic sentences for our language. All other sentences are produced from kernel sentences.

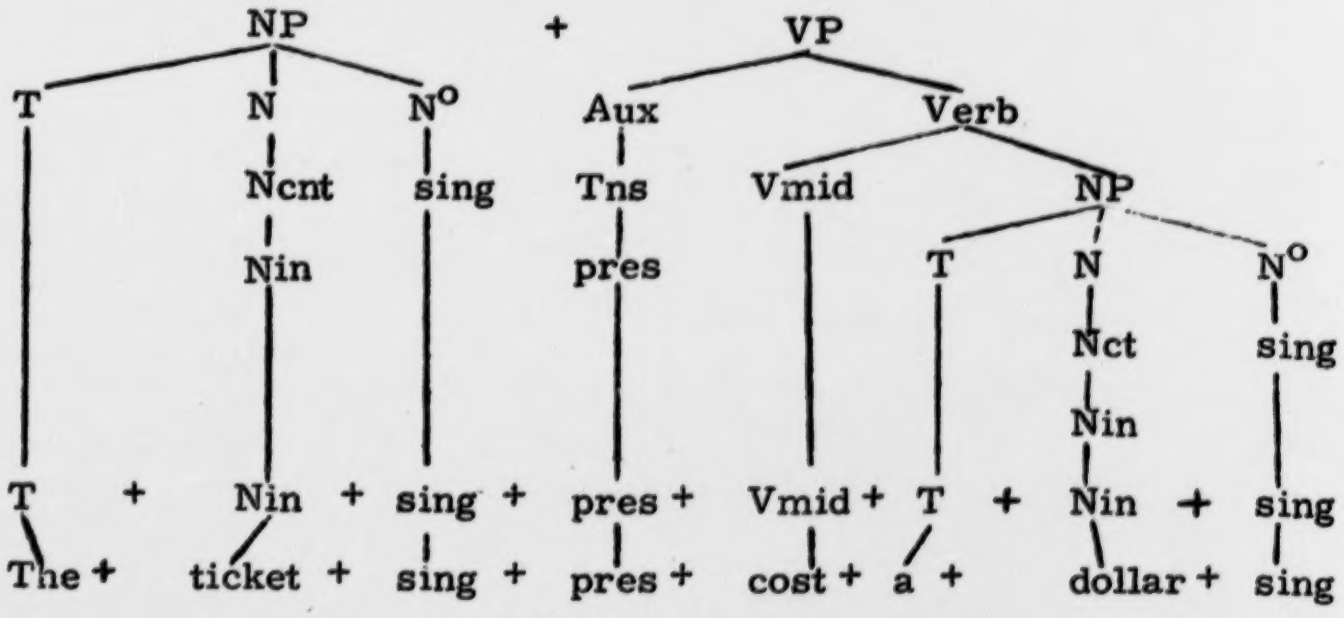
How do we know a kernel sentence when we see one? Is this, for example, a kernel sentence according to the rules we know?

The ticket costs a dollar.

In order to decide whether or not this is a kernel, we break the sentence into its component parts:



Next we reduce each parts to its set of terminal symbols.

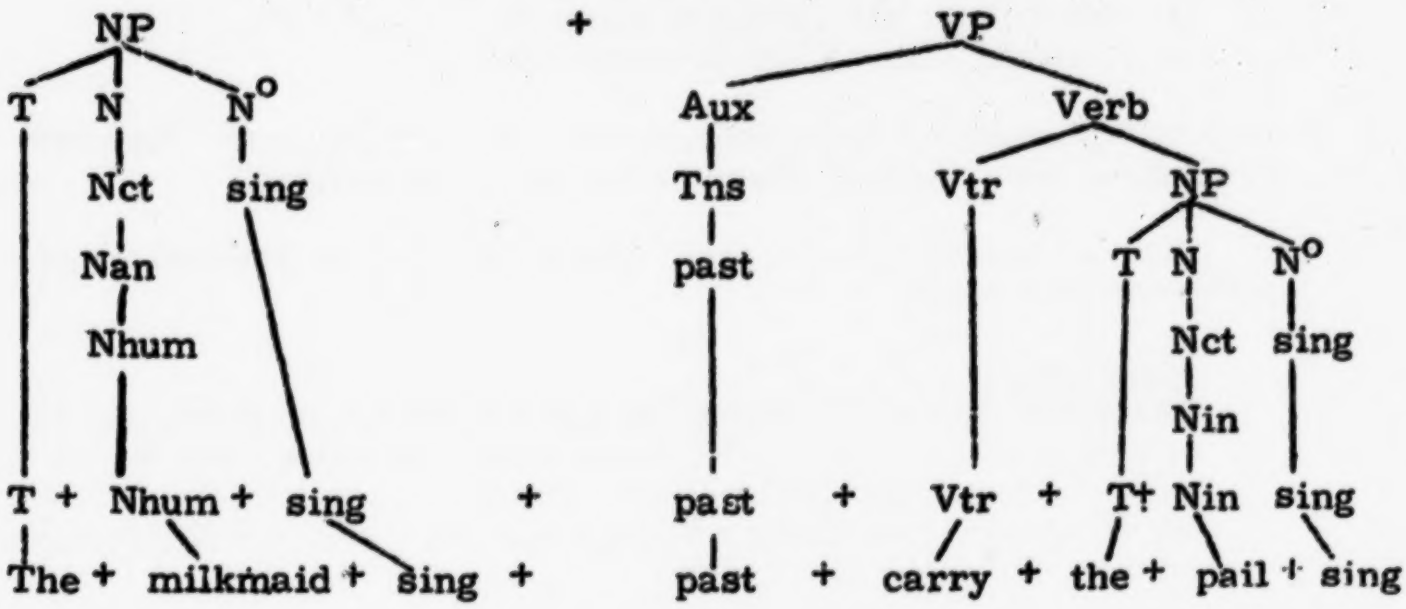


Since all elements in the sentence are explained by the phrase structure rules, this is a kernel sentence.

Is this also a kernel sentence?

See following page.

The milkmaid carried the empty pail.



Were all of the elements of the sentence explained by the phrase structure rules? Which one wasn't? Perhaps this is not a kernel sentence, then, because the word empty does not fit into the basic string. The basic string accounted for "The milkmaid carried the pail." How then did empty get into our sentence?

Let's look at another sentence containing empty: "The pail was empty." Is this a kernel sentence? What is the sentence string for it? In this sentence empty is an adjective Pr. Since this sentence and "The milkmaid carried the pail." both contain pail, perhaps they can be combined. "The milkmaid carried the empty pail."

The combining of two kernel sentences in this way is called transforming. Transformations of this type and of other types as well enable us to "grow" sentences from kernels.

Which of these is a kernel sentence?

1. The garden was colorful.
2. The garden which lines the driveway was colorful.

Which parts of sentence 2 keep it from qualifying as a kernel sentence?

Of these sentences, which is the kernel?

1. The barn was whitewashed by Steve.
2. Steve whitewashed the barn.

In the sentence which isn't a kernel, what elements cannot be explained by phrase structure rules? Has new information been added to the kernel sentence in order to form the transformed sentence?

Which of these is the kernel and which is transformed:

1. The clerk has filed the reports.
2. Has the clerk filed the reports?

How has sentence 1 been changed to make sentence 2? Has new information been added? Have parts been rearranged?

Kernel sentences, we find, can be altered in several ways to make different sentences.

Exercise 1:
Study the following sentences and decide which ones can be explained by the phrase structure rules you know, and write strings of terminal symbols for them. (See examples on pp. 1 and 2) Be prepared to explain why you can not write strings for the others.

A.
1. Has father had malaria?
2. The potatoes were becoming mushy.
3. A nurse brought the girl some pills.
4. The boys were sitting on the floor.
5. The sale will end on Saturday.
6. A glass fell to the floor noisily.
7. Diane has been upstairs all morning.
8. The people should have moved to the mountains.
9. A boat sailed softly on the lake.
10. The garden has been watered by the maid.

B.
1. Snow has been falling.
2. We have been having an argument.
3. The salmon swallowed the minnow.
4. The minnow was swallowed by the salmon.
5. Mary opened the envelope excitedly.
6. How did Mary open the envelope?
7. The book Kidnapped must be popular.
8. The captain will give the command.
9. Will the captain give the command?
10. Who will give the command?

In the lessons that follow, we will examine some of the ways kernel sentences can be converted to make other sentences of our language. Such conversions are called transformations. From the phrase structure rules and kernel sentence, then, we now pass to transformation rules and the transformed sentence.

SINGLE-BASE TRANSFORMATIONS

THE PASSIVE TRANSFORMATION

In the sentences just discussed, what were the differences between the kernel sentences and those that were not kernels? You probably noticed that the differences were simple ones. Let us look at some of the sentences again and try to point out the differences. There were three.

(1) In one case, there was an important shift in the position of some words of the first sentence to produce the second sentence. (What was shifted in the following sentence?)

The clerk has filed the reports ⟹ *

Has the clerk filed the reports?

(2) In another case, there was an addition of some basic words which were necessary because there was also a shift in the position of some words. (What was added and what was shifted in this sentence?)

Steve whitewashed the barn. ⟹

The barn was whitewashed by Steve.

(3) Finally, in some sentences there was both a shift of words and the addition of basic words; but also, one of the words or groups of words in the kernel sentence was replaced with a question word.

Mary opened the envelope excitedly. ⟹

How did Mary open the envelope?

In all of these transformations something happened to single kernel sentences to change them into other kinds of sentences. Therefore we can call these transformations simple transformations or single-base transformations, because they happen to single sentences.

In this section we are going to look at a single-base transformation, which deals with rearranging the words in one sentence at a time. This is a transformation you are already familiar with because we talked about it when we were writing the phrase structure rules to distinguish mid verbs from transitive verbs--Rules (9) and (10). We called it the passive transformation. Do you remember what elements must be present in order to transform a kernel sentence to the passive form? Perhaps you recall that an element in the verb phrase trades places with the noun phrase. In effect, we reversed the sentence but did not change the meaning. What kind of sentences were we able to make passive? Here are the strings for the five types of kernel sentences based on the five main types of verbs. Which of these sentences arrangments can be made passive?

---

*The double arrow is the symbol used to indicate that one sentence has been changed (transformed) to make a new sentence.

a. NP + Be + Pr (as in John is a scorekeeper)
b. NP + Vlnk + Pr (as in The girl appeared tired.)
c. NP + Vmid + NP (as in The tickets cost a dollar.)
d. NP + Vtr + NP (as in Joan bought the tickets)
e. NP + Vin (as in The sunflowers are growing.)

A kernel sentence can become passive if the verb is transitive, which means, of course, that it will be followed by an NP and may be followed by a Man (manner adverb).

In the sentence "Finnegan chose a weapon.", the arrangement NP^1 + Vtr + NP^2 can be transformed to "A weapon was chosen by Finnegan." Is a reversing of NP^1 and NP^2 all that takes place? Our sentence does not read "A weapon chose Finnegan." This would be a change in meaning. What change does the verb undergo? Are there other additions to the sentence? How would you describe everything that happened during the passive transformation?

Try to apply the passive transformation to each of the following sentences to see if your description is accurate.

1. Marconi invented the wireless.
2. The spy gave the signal.
3. A pontoon supports the bridge.
4. Sandy became the secretary.
5. The snake bit Cleopatra.
6. Woodrow is my friend.
7. The witness spoke the truth.
8. An avalanche erased the tracks.
9. That dog must have fleas.
10. Fred was filling the tanks.
11. The deputy should have examined the signatures.
12. The Joneses could have fed the animals.

Were you able to make each sentence passive? Which ones were you not able to transform in this way? In each sentence that you were able to transform, what did you add to the verb of the original sentence? What else did you add to the sentence? Using sentence #1 as an example, let us write the sentence strings which underlie the original sentence and the transformed sentence.

NP^1 + past + invent + NP^2

Marconi invented the wireless ⟹

NP^2 + past + be + en + invent + by + NP^1

The wireless was invented by Marconi.

The new elements appear to be be + en and by. Where was be + en inserted in the transformed sentence? Where was by inserted? Let's look at #10 and see if the same process went on.

NP^1 + past + be + ing + fill + NP^2

Fred was filling the tanks ⟹

NP^2 + past + be + ing + be + en + fill + by + NP^1

The tanks were being filled by Fred.

Where did we insert the be + en? Where the by?

So we see that in addition to reversing NP^1 and NP^2 we insert be + en between Aux and Vtr and by between Vtr and NP^1. You have noticed that in sentence 1 the only auxiliary is tense, but in sentence 10, the auxiliary is tense + be + ing. The important thing to remember is that the be + en goes just between the auxiliary whatever it may be, and the root verb. We can write the rule for the passive transformation, then, in this way.

PASSIVE TRANSFORMATION

NP^1 + Aux + Vtr + NP^2 ⟹ NP^2 + Aux + be + en + Vtr + by + NP^1

You remember, of course, that the symbol be + ing means that a form of the verb be is followed by a verb ending in ing. The ing ending goes with the word following. Similarly, be + en means that a form of the verb be is followed by a verb in the en form. So when be + en is inserted between Aux and Verb the verb must take its en form.

How do you account for the fact that 4, 6, 9 can not be transformed into the passive? Change the verb in each so that the sentences can be made passive.

Exercise 1:
Apply the rule for passive transformations to the following sentences. Write the symbol strings for the kernel sentences and for the transformed sentences.

Example:

NP^1 + past + Vtr + NP^2

The farmer plowed the field ⟹

NP^2 + past + be + en + Vtr + by + NP^1

The field was plowed by the farmer.

A. 1. Fog limited the visibility.
2. Loggers had cleared the land.
3. The students must accept the responsibility.
4. The waves sprayed the highway.
5. The theater might refund the money.

6. Adam must have eaten an apple.
7. The judge dismissed the case.
8. Children followed the piper.
9. The cook will freeze the pies.
10. Karsh would have taken some pictures.

B. 1. The winners will drink the lemonade.
2. Mother drove the car through the garage.
3. Gregory Peck was telling the story.
4. He can do the job quietly.
5. The girl rode a stallion in the race yesterday.
6. An astronomer knows stars well.
7. Cassie spilled the syrup on the floor.
8. The camel gives the Arabs transportation.
9. The operator must have called the police.
10. Millions will see the fair this year.

Remember:

1. Sentences with transitive verbs can go through a passive transformation.

2. In the passive transformation three things happen:
   1) NP^1 and NP^2 change places
   2) be + en is inserted immediately before the main verb
   3) by is inserted between the verb and NP^1.

NP^1 + tns + verb + NP^2

The man bit the dog

NP^2 + tns + be + en + verb +

The dog was bit

by + NP^1

by the man

QUESTION TRANSFORMATIONS

Another kind of single base transformation is the question transformation. Early in our study of grammar we noticed that kernel sentences are not the kind of English sentences generally spoken by you and your friends. For example, your daily conversations normally include many questions. Such utterances are more complicated than kernel sentences, but each question that you speak or hear or read is derived from a kernel sentence. That is, questions grow out of kernel sentences. To understand what happens in this process let us transform some kernel sentences into questions. As we do this, look for answers to these questions:

1. **What actually goes on when we transform kernels into questions?**

2. **Are all questions derived from kernel sentences in the same way?**

3. **Can we predict what will happen in question transformations so that we can make a rule to describe it?**

Yes or No Questions

Exercise 1:
Here is a group of kernel sentences. Rewrite them as questions that require a yes or no answer. Try to do this without adding or substituting any words.

Example:

Terry can drive a car. ⟹ Can Terry drive a car?
We have won the game. ⟹ Have we won the game?

Kernel	Question
1. The child has broken the wagon ⟹	
2. Mother was serving waffles ⟹	
3. The baby was happy. ⟹	
4. The flowers will wilt there. ⟹	
5. You can determine the circumference. ⟹	
6. Marcia had lost the cake. ⟹	
7. The men have radioed an SOS ⟹	
8. Red could taste the poison. ⟹	
9. That might be the solution. ⟹	
10. The president should have named the committee ⟹	

What simple operation transformed these kernel sentences into questions?

What has happened to the word order?

What have you written before the subject NP?

What kind of auxiliary does every verb have?

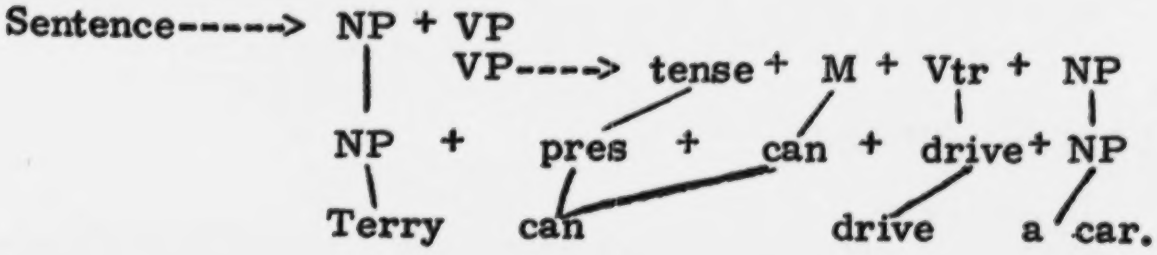
What other kinds of auxiliaries may verbs have? Which of these can you find in the sentences in Exercise 1?

If a verb is made up of more than one word, which part is written before the subject in yes or no questions?

What makes sentence #3 different from the others? Why doesn't the verb here need an extra word to ask a yes or no question?

How is the string of symbols for the yes or no question transformation different from the kernel string? Let us make use of phrase structure rules to write the string of symbols for the example sentences in Exercise 1. Since the Verb Phrase seems to be the part of the sentence involved in this transformation, we will break down only that part in our symbol string.

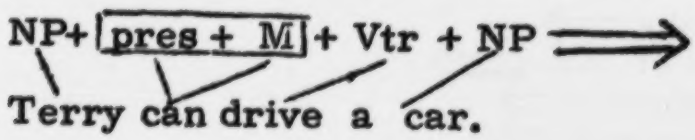
Terry can drive a car

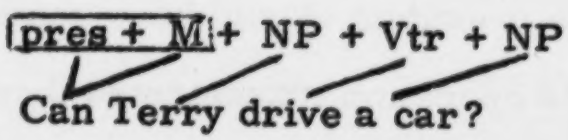


When we transform this sentence into a question, what word is moved to the front of the sentence?

Terry can drive a car. ⟹ Can Terry drive a car?

What symbol in our string corresponds to this word which was moved to the left of the subject? Remember that we learned in our study of verbs that tense automatically fastens itself to the first word in the verb string. It is written right before the helper in the string of symbols. If the helping auxiliary moves to the left of the subject, what do you think will automatically move with it? In our sample sentence above, the modal can moves to the left. What then must move to the left in our string of symbols to show the transformation?



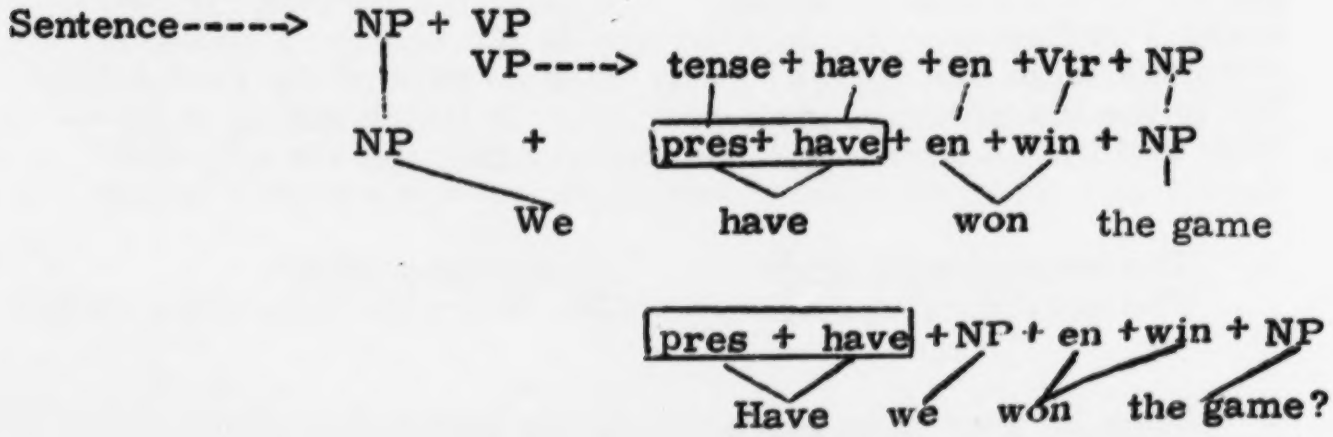


Compare the two strings of symbols above, to see what has happened in the transformation. We have simply written tense and

the first word in the verb string--M in this sentence--before NP to indicate that the modal can, with tense attached, now appears first in the sentence.

What happens in our other example?

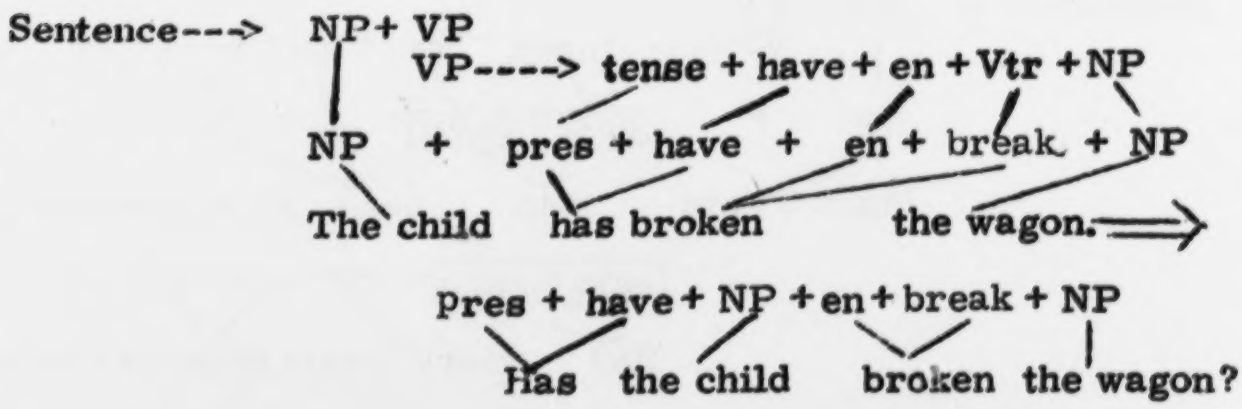
We have won the game.



Exercise 2:
Construct strings of symbols for thekernel sentences in Exercise 1. To do this you may need to review the phrase structure rules about auxiliary verbs. Then write the symbol string above each transformed sentence which you wrote.

Example:

The child has broken the wagon.


Sentence---> NP + VP
VP----> tense + have + en + Vtr + NP
NP + pres + have + en + break + NP
The child has broken the wagon.
Pres + have + NP + en + break + NP
Has the child broken the wagon?

Look closely at the strings of symbols you have written for the yes or no questions in Exercise 1. What auxiliary appears first in each string? What other symbol precedes the subject in each rewritten string? In sentence # 10, what auxiliaries are there? Do they all move to the beginning of the sentence when it is transformed to a yes or no question? In sentence #10 it is tense + M, since the modal is the first auxiliary in the sentence string. We can assume, then, that when we make a yes or no question, tense and either M, have, or be (which ever one is first) moves from its normal position after the NP in the kernel to the initial (first) position.

Terry can drive. ⇒ Can Terry drive?
We have won. ⇒ Have we won?
Mother has been serving waffles ⇒ Has mother been serving waffles?

Yes and no questions with the verb Be

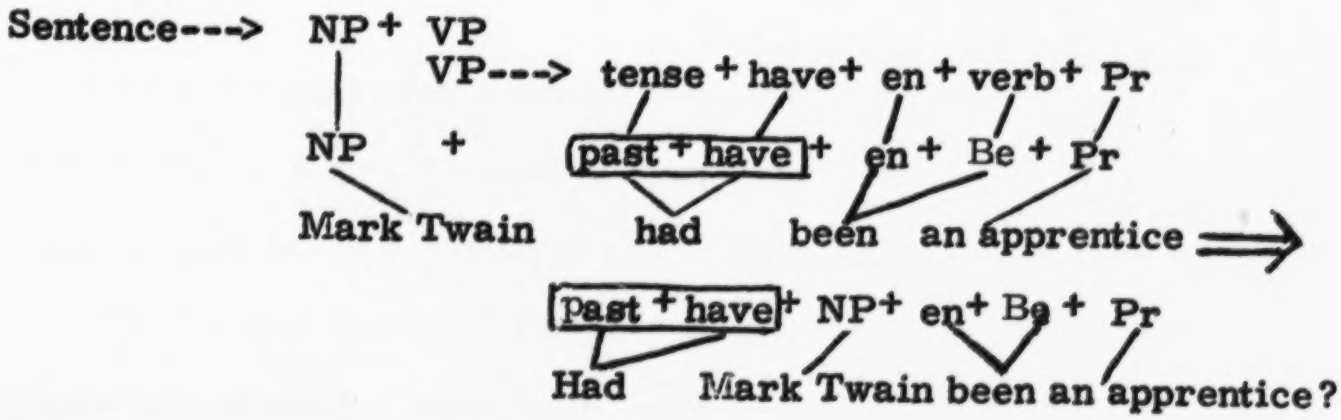
In the sentences we have been looking at what usually follows the NP in the question string? Compare the strings for Sentences 2 and 3 in Exercise 2. In what way is the sentence string for #3 different from that for #2? Why does no part of the verb follow NP in the transformed string for #3? In which string is Be a verb and not an auxiliary? Remember that the verb Be can invert in a question without having an extra word as a helper.

The baby is sick. ⇒ Is the baby sick?
The corridors were noisy ⇒ Were the corridors noisy?

Does Be ever have extra words for helpers as other verbs do? Rewrite these statements as yes or no questions.

1. Mark Twain had been an apprentice.
2. The captain has been mistaken.
3. The captain was at home.

Does Be have any extra words as helpers in these sentences? When Be has helpers, what part of VP appears before NP in the question string? Look at the string of symbols for Sentence 1 in the example above.


Sentence---> NP + VP
VP---> tense + have + en + verb + Pr
NP + past + have + en + Be + Pr
Mark Twain had been an apprentice
past + have + NP + en + Be + Pr
Had Mark Twain been an apprentice?

Construct similar strings of symbols for Sentences 2 and 3 above.

What conclusions can we draw from our discussion thus far? In deriving yes or no questions from kernel sentences:

1) The auxiliary M, have, or Be (which ever comes first) moves to the initial place in the question. (Remember that tense attaches to the helper and moves automatically with it.)

The flowers will wilt there ⇒ Will the flowers wilt there ?

The men have radioed an SOS ⟹
Have the men radioed an SOS?

Mother was serving the waffles ⟹
Was mother serving the waffles?

2) If the verb Be in the kernel sentence lacks a helper, Be moves to the initial position in the question.

The baby was happy. ⟹ Was the baby happy?
The captain was at home. ⟹
Was the captain at home?

but if the kernel contains be plus a helping word, only the helper moves to the initial place in the question.

Bryant had been guilty ⟹ Had Bryant been guilty?
The woman was being malicious ⟹
Was the woman being malicious?
The death could have been an accident. ⟹ ?

Forming yes and no questions from kernels which do not have M, be, or have auxiliaries.

Can we form yes or no questions from kernel sentences that do not contain one of the auxiliaries, M, have, or be, or the verb Be? In our study of phrase structure Rule (7), the Be Verb, we determined that certain things happen to a verb when a sentence is stated as a yes or no question. Do you remember what verb we added to act as an auxiliary when the sentence lacked a M, have, or be auxiliary? To test your memory, transform these sentences into yes or no questions.

1. The sea became rough ⟹
2. The referee announced the decision ⟹
3. Ken delivers the paper. ⟹
4. Spacemen take risks daily. ⟹

What word did you add to form these questions? Which form of this word is present tense? Which is past tense? Why must the auxiliary in Sentences 1 and 2 take a past tense form? In our phrase structure rules we learned that tense had to attach to the auxiliary. See what would happen if tense stayed with the verb instead of moving with the auxiliary.

The sea became rough ⟹ Do the sea became rough?
The referee announced the decision ⟹
Do the referee announced the decision?

Why must the auxiliary that you added in Sentences 3 and 4 above take a present tense form? To answer this question let us construct the symbol strings for the sentences and for their yes or no transformations.

Examples:

1. The sea became rough

NP + past + become + Pr

The sea became rough ⟹

Past + do + NP + become + Pr

Did the sea become rough?

2. The referee announced the decision.

NP + past + announced + rest of sentence

The referee announced the decision. ⟹

Past + do + NP + announce + rest of sentence

Did the referee announce the decision?

3. Ken delivers the paper

NP + pres + deliver + NP

Ken delivers the paper ⟹

Pres + do + NP + deliver + NP

Does Ken deliver the papers?

4. Spacemen take risks

NP + pres + take + risk

Spacemen take risks ⟹

Pres + do + NP + take + NP

Do spacemen take risks?

Exercise 3:
Rewrite these kernel sentences as yes or no questions. Then construct strings of symbols for the kernels. Finally write a symbol string for each transformed sentence as in the examples above.

A. 1. The hunter wounded the cow.
   2. The lakes border the park.
   3. Josie seems frightened.
   4. The vase contains buttermilk.
   5. You passed the test.
   6. Cats like popcorn.
   7. Freddie swallowed the gum.

8. The gooseberries look ripe.

B. 1. Lightning started the fire.
2. A stampede was the result.
3. The puppets have strings.
4. They have seen the Potomac.
5. Noah sent a dove hopefully.
6. This frosting becomes thick.
7. The detective will suspect the hero now.
8. The cookie crumbles easily.

We have seen that when we transform kernel sentences into yes or no questions, certain things happen automatically.

1) What happens to the normal word order?

2) Which auxiliaries move to the left of the subject?

3) Why does tense shift with the auxiliary that moves?

4) If the kernel string contains neither M, have, or be auxiliary or the verb Be what helper is added automatically to form the yes or no question?

5) What two processes or operations take place then in deriving a yes or no question from a kernel string?

Let us see now how we can put this information into a rule. First we will review what happened to the string of symbols of a kernel sentence when it was transformed into a yes or no question. Look again at the strings for Sentences 1, 2, and 4 in Exercise 2 and Sentence 6 in Exercise 3.

1. NP + pres + have + en + verb + NP
The child has broken the wagon. ⟹

pres + have + NP + en + verb + NP
Has the child broken the wagon?

2. NP + past + be + ing + verb + NP
Mother was serving waffles ⟹

past + be + NP + ing + verb + NP
Was mother serving waffles?

4. NP + pres + M + verb + Loc
The flowers will wilt there ⟹

pres + M + NP + verb + Loc
Will the flowers wilt there?

6. NP + pres + verb + NP

Cats like popcorn ⟹

pres + do + NP + verb + NP

Do cats like popcorn?

In each kernel string, what symbol appears first? What symbol appears first in VP? In sentences 1, 2, and 4, what auxiliary (helping word) helps to ask the yes or no question? What word is automatically added to Sentence 6 when it is transformed into a yes or no question? Why? In our rule, what symbol will we use to show that the auxiliary used in this transformation will be either M, have, be or do? (Reminder: it is the same symbol we used in the phrase structure rules to show that an element in a sentence could be one or another but not both.)

Using your answers to the above questions, try to construct the first part of the string of symbols for a kernel sentence that can be transformed to a yes or no question. This will be just the part that is actually involved in the transformation. You may use a dash (__) to show that some sentences have nothing between the tense and the verb. These, of course, are the ones to which we add do.

To account for all possibilities your string should look like this: NP + Tns + { M / have / be / __ }

What else do we need in our string in order to write a rule for the yes or no transformation? The symbols we have just written show that in the part involved in the transformation all sentences are similar. Each string begins in normal word order with NP + VP, and each VP has tense Tns alone, or Tns + M, have, or be before the verb.

The kernel strings for our four sample sentences look like this: (The perpendicular line divides what we have written so far in our rule from the remainder of each sentence.)

1.	NP +	pres +	have	+	en +	verb + NP
2.	NP +	past +	be	+	ing +	verb + NP
4.	NP +	pres +	M	+		verb + Loc
6.	NP +	pres +		+		verb + NP

As you remember from your phrase structure rules, many different things are found in kernel sentences. The verb itself may be any of the ones we studied in phrase structure rules, such as Vlnk requiring Pr, or Vtr with an NP^2, etc. How could you show all of this in one rule? Do we need to know at this point what happens in the rest of the kernel sentence? In writing a yes or no question from a kernel sentence we are concerned with changing the word order of only the NP and

Tns + M, have, or be; or the order NP and Tns alone. In other words, we want to show that when a sentence has M, have, or be following Tns, the Tns plus M, have or be changes places with the NP. But when a sentence string does not have M, have, or be, only Tns changes places with the NP. And, as we have observed, it then becomes necessary to add do. This is really a separate operation but for now we will simply want to show that the changes which occur in the question transformation operate only on these items at the beginning of the sentence.

$$NP + Tns + \begin{Bmatrix} M \\ have \\ be \\ — \end{Bmatrix} \Longrightarrow \quad Tns + \begin{Bmatrix} M \\ have \\ be \\ — \end{Bmatrix} + NP$$

No change takes place in the order of the rest of the sentence nor do we add any more words to the rest of the sentence. For the present, then, we need nor worry about what happens in the remainder of the sentence. We can show this by writing our rule in this way:

T_Q

$$NP + Tns + \begin{Bmatrix} M \\ have \\ be \\ — \end{Bmatrix} + \text{rest of sentence} \Longrightarrow$$

$$Tns + \begin{Bmatrix} M \\ have \\ be \\ — \end{Bmatrix} + NP + \text{rest of sentence.}$$

T_Q is a label which we give to this transformation. The T stands for transformation and the Q stands for question. You can see that this rule would apply to a great many sentences. Whenever you find NP + Tns + M, have, be, or just Tns alone before the main verb you can perform this transformation. The be can be either the verb be or the auxiliary be.

Remember:

1. The yes-or-no question transformation changes the order of the NP of a sentence and what immediately follows it.

2. If tense + modal or the auxiliaries <u>have</u> or <u>be</u> immediately follow the NP they move to the front of the sentence.

   John will catch the bat. ⟹ Will John catch the bat?
   John has caught the bat. ⟹ Has John caught the bat?
   John is catching the bat. ⟹ Is John catching the bat?

3. If <u>M</u>, <u>have</u>, or <u>be</u> do not follow the NP only the tense moves and it then becomes necessary to add <u>do</u>.

   John hits the ball. ⟹ Does John hit the ball?

4. If <u>Be</u> is the main verb it can move to the front without any auxiliary other than tense.

   Jack is a knave. ⟹ Is Jack a knave?

<u>Review Exercise</u>
Transform these sentences into <u>yes</u> or <u>no</u> questions as shown in 1, 2, 4, and 6 on pages 25 and 26.

1. The boys were trading books.
2. Susan delivers the paper
3. The phone has been ringing.
4. The milkman could have been here.
5. Telegrams cause excitement.
6. A rider approached the camp cautiously.
7. This painting resembles that scene.
8. The dog had broken the leash.
9. You must go.
10. Mr. Jefferson remained calm.

Replacement of the Object

So far our questions have resulted from a simple operation. We have simply rearranged the word order of the kernel sentence and occasionally have added do to make the question grammatical. Other questions that we use have a more complicated structure because more than one change occurs in the forming the question.

To see what happens look carefully at these groups of sentences. Write K before each kernel. Underline the yes or no questions.

Group A

Frank hit the boy ⟹
Did Frank hit the boy? ⟹
Whom **did Frank hit?**

Group B

Sally has lost the book ⟹
Has Sally lost the book? ⟹
What **has Sally lost?**

Group C

The child could have seen a ghost ⟹
Could the child have seen a ghost? ⟹
What **could the child have seen?**

Group D

The baby has swallowed the bee ⟹
Has the baby swallowed the bee? ⟹
What **has the baby swallowed?**

Which sentence in each group is the kernel? Which is the yes or no question? What happens to the word order in forming yes or no questions? What helper do we sometimes add to ask yes or no questions?

As you have noticed, each group has two questions. To form the yes or no question we moved part of the verb to the initial place in the sentence. What word appears first in the second question in each group? Is some word missing which appeared in the first two sentences? Do you think the new word replaces the missing word?

What label do we give to the boy in the kernel sentence in Group A? This is, of course NP^2 which follows Vtr. You will remember that it is sometimes called the object. What is the object (NP^2) in the yes or no question in Group A? What word in the yes or no question does not appear in the second question in Group A? What new word appears in the second question? We lose the object, the boy, and gain the word whom when we write the second question. What is the relation, then, between the boy and whom? The two expressions are actually the same.

Frank hit the boy
Frank hit whom?

You may wonder why whom rather than who is used in this sentence. Standard English requires that we use the form whom to replace the object word in a sentence. If we were to replace the subject word what would we use? **We replace a human noun which is an object NP with whom; we replace a human noun which is a subject with who.**

In the sentence above, whom simply replaces the object, the boy, in order to ask a certain type of question. Since the object

is replaced by the question-word whom to ask this question, we call this kind of transformation replacement of the object. Obviously, this transformation will take place only in sentences which have NP^2.

What word occurs in the initial place in the sentence in a replacement of object question? In Group A it is whom. What is it in Groups B, C, and D? Either whom or what may replace the object to ask this kind of question, and the replacement word (whom or what) appears first in this question transformation.

Now let's summarize what happens in this transformation.

Kernel	Frank hit the boy ⟹	
Yes or no question	Did Frank hit the boy ⟹	What has happened to the word order here? Why is did added?
Replacement of object:	Whom did Frank hit?	What word asks the question? What word does whom replace? Which part of this question is exactly like the yes or no question?

Because we have already written part of the verb before the subject in the yes or no question, all we have to do is replace the boy with whom and move whom to the initial place in the sentence.

Exercise 5:
Transform these sentences into object replacement questions. Remember that this kind of question goes through two operations.

Example:

Kernel
Anne has shot the bear. ⟹

Yes or no
Has Anne shot the bear. ⟹

Object replacement
What has Anne shot?

A. 1. The rustlers stampeded the cattle. ⟹
2. Marcie was chewing her nails. ⟹
3. George Washington had crossed the Delaware. ⟹
4. John is quitting the team immediately. ⟹

5. You have a lump on your forehead. ⟹
6. The policemen must have seen the accident. ⟹

B. 1. The children wrecked the automobile.
2. Philip was showing his creation.
3. A chipmunk had grabbed the potato chip.
4. The troubadors played their guitars.
5. You have finished the test on time.
6. The technician will have completed the report tomorrow.

What symbol do we use for an object NP? How shall we symbolize the word that replaces the object NP in this kind of transformation? We say that wh can be attached to NP^2 to produce what or whom, in this way: wh-NP^2. This symbol means that the NP^2 will become what or whom. When will it become what? When will it become whom?

We have found that we may add wh to an NP^2 in a sentence string which has gone through the question transformation, (Did Frank hit the boy ⟹ Whom did Frank hit?) This is really another change or transformation which we will call the wh-attachment transformation or $T_{wh\text{-}attachment}$. It would simply say

$T_{wh\text{-}attachment}$

$NP^2 \Longrightarrow$	wh-NP^2 when NP^2 is in a string which has already gone through T_Q.

The effect of this wh-attachment is to replace NP^2 with a wh-word, either whom or what.

Now let's see what happens when we replace the NP^2 with whom or what.

Tns + do + NP^1 + hit + NP^2 ⟹ Tns + do + NP + hit + wh-NP^2

Did the boy hit the ball ⟹ Did the boy hit what?

Tns + do + NP^1 + scare + NP^2 ⟹ Tns + do + NP^1 + scare + wh + NP^2

Did the boy scare the girl ⟹ Did the boy scare whom?

Are the two sentences produced by this transformation grammatical? What must be done to make them grammatical? A change (or transformation) must draw the what or whom to the beginning of its sentence. This transformation is called T_{wh} because it is a transformation involving the wh word.

Did the boy hit what ⟹ What did the boy hit?
Did the boy hit whom ⟹ Whom did the boy hit?

This transformation, then, operates on sentence strings which have already gone through T_Q and which have an NP^2. Now let's try to write the rule which shows how the object replacement question is formed. The symbols for the part of the string which has already gone through T_Q will be:

$$\text{Tns} + \left\{\begin{matrix}\text{M}\\ \text{have}\\ \text{be}\\ \text{do}\end{matrix}\right\} + \text{NP} \ldots$$

We can use three dots (. . .) to show that we are interested only in this part of the sentence and we will, of course, include NP^2 because it is involved in this particular transformation. So the whole string will be:

$$\text{Tns} + \left\{\begin{matrix}\text{M}\\ \text{have}\\ \text{be}\\ \text{do}\end{matrix}\right\} + \text{NP}^1 \ldots \text{NP}^2$$

With this information in mind we can now write the rule which shows the changes which occur in the symbol string in the object replacement. We will need to show that there are two steps to the process: First the wh is attached to the NP^2. Then the wh-NP^2 is drawn to the front of the sentence. Object replacement:

$$\text{Tns} + \left\{\begin{matrix}\text{M}\\ \text{have}\\ \text{be}\\ \text{do}\end{matrix}\right\} + \text{NP}^1 \ldots \text{NP}^2 \Longrightarrow$$

wh-attachment $\quad \text{Tns} + \left\{\begin{matrix}\text{M}\\ \text{have}\\ \text{be}\\ \text{do}\end{matrix}\right\} + \text{NP}^1 \ldots \text{wh-NP}^2 \Longrightarrow$

Twh $\quad \text{wh-NP}^2 + \text{Tns} + \left\{\begin{matrix}\text{M}\\ \text{have}\\ \text{be}\\ \text{do}\end{matrix}\right\} + \text{NP}^1 \ldots$

Now let's show how this rule for the object replacement actually works by applying it to a sentence and writing the symbol strings, first for the kernel sentence, then for the yes or no transformation and finally for the object replacement.

Sentence: Frank hit the boy. (kernel sentence)

NP + past + verb + NP^2

Frank hit the boy. ⟹

tns + do + NP + verb + NP^2 (yes or no question)

Did Frank hit the boy? ⟹

Tns + do + NP^1 + verb + wh-NP^2

*Did Frank hit whom (wh-attachment) ⟹

wh-NP^2 + past + do + NP^1 verb

Whom did Frank hit (object replacement)

Exercise 6:
Rewrite these kernel sentences 1) as yes or no questions, and 2) as replacement of object questions. Remember there are two steps in this process.

Example:

Kernel
The gypsy wore a charm ⟹

Yes or no transformation
Did the gypsy wear a charm ⟹

Attaching wh
Did the gypsy wear what. ⟹

Drawing wh-NP^2 to the beginning
What did the gypsy wear?

1. Mrs. Hale designed the costumes ⟹
2. The girls had a dance ⟹
3. The heroine should have married the villain ⟹

4. Patrick kissed the Blarney Stone ⟹
5. The deer nibbled the salt. ⟹
6. She is reading Robinson Crusoe. ⟹
7. We will watch the broadcast today. ⟹
8. Seth had eaten the evidence. ⟹
9. They should have asked the principal ⟹
10. Johnny Appleseed planted seeds carefully ⟹

Exercise 7:
Construct symbol strings for the kernel sentences and transformations in Exercise 5.

Example: The gypsy wore a charm.

Kernel
NP + past + verb + NP^2

The gypsy wore a charm ⟹

Yes or no
past + do + NP + verb + NP^2

Did the gypsy wear a charm? ⟹

Attachment of wh
past + do + NP^1 + verb + wh-NP^2

Did the gypsy wear what? ⟹

Drawing wh-NP^2 to the beginning.
wh-NP^2 + past + do + NP + verb

What did the gypsy wear? ⟹

Let us now summarize what happens in object replacement questions:

1. We start with a kernel
   NP + pres + have + en + buy + NP^2
   The man has bought the car
2. We change the kernel to a yes - no question.
   Pres + have + NP^1 + en + buy + NP^2
   Has the man bought the car?
3. We add wh to the NP^2
   Pres + have + NP^1 + en + buy + wh-NP^2
   Has the man bought what?
4. We move wh-NP^2 to the beginning of the sentence.
   Wh-NP^2 + pres + have + NP^1 + en + buy.
   what has the man bought?
5. Wh-NP^2 becomes whom if it is human noun; it becomes what if it is non-human.

Other Question Replacements

As we have seen, the object is often replaced by another word to ask a question. Now we need to see whether other words in a sentence may be replaced to ask other kinds of questions.

Earlier we found that both transitive and intransitive verbs can take manner adverbials. Do you remember what question manner adverbials answer?

The burglar tiptoes softly.
The children burst into the room noisily.

These are the words that make a how (meaning In what manner?) question possible. When the verb in a sentence is Vtr or Vin, we test for a manner adverbial by changing the sentence into a question beginning with how or In what manner:

The soldiers fought bravely ⟹
How did the soldiers fight?

Teenagers should drive carefully ⟹
How should teenagers drive?

Since how here actually means "in what manner" we call the word it replaces a manner adverbial.

Exercise 8:
Copy the following sentences and underline the manner adverbials. Then transform each sentence into a question beginning with how.

Example: The teacher spoke distinctly ⟹
How did the teacher speak?

A.
1. Hortense ate the halibut hurriedly. ⟹
2. The captain accepted the penalty reluctantly. ⟹
3. The actors performed well. ⟹
4. Students should have reviewed carefully. ⟹
5. It rained heavily yesterday. ⟹
6. The cake must be beaten lightly. ⟹
7. George does everything right. ⟹
8. The stove heated the room quickly. ⟹
9. The policeman jerked the intruder upright. ⟹
10. The players had been soundly trained. ⟹

B.
1. The cat sprang noiselessly onto the table. ⟹
2. The secretary has been working efficiently. ⟹
3. Ice melts quickly in the summer. ⟹
4. We have been generously rewarded. ⟹
5. Otto eyed the stew disgustedly. ⟹
6. Cary had seized the reins cautiously. ⟹
7. He craftily inserted the key in the lock. ⟹
8. Max clamped the edges together tightly. ⟹
9. The lad sneakily crossed the backyard. ⟹
10. The neighbor has been playing the radio thoughtlessly all night. ⟹

An easy way to determine what happens in the how question is to compare it with other questions we have studied. First, transform Sentence 1 into several questions.

Kernel: Hortense ate the halibut hurriedly.

Yes or no:_____
Object replacement:_____
How question: How did Hortense eat the halibut?

Which other questions have a word order similar to that of the how question?

The question formed by replacing a manner adverbial with how is similar in word order to both the object replacement and the yes or no question transformations. What question did we build the object replacement question on? Remember that after we had changed the word order to form the yes or no question, we needed only to replace the object word with what or whom to form the object replacement question.

In the how question we again build on the yes or no question transformation.

Kernel: Hortense ate the halibut hurriedly ⇒
Yes or no: Did Hortense eat the halibut hurriedly ⇒
Manner adverbial: How did Hortense eat the halibut?

What does how replace? Where does the question-word how appear in the transformed question?

How shall we construct the symbol string for the manner transformation? Remember that this transformation is built on the yes or no question string. First, write the symbol string for the kernel sentence. What must a kernel sentence have in order to undergo a manner transformation? We will use our sample sentence above.

Hortense ate the halibut hurriedly.

1. Sentence----→ Kernel _____ + _____ + ___ + _____ + (Man)
Hortense ate the halibut hurriedly.

The second step in the operation is to transform the kernel into a yes or no question, and to write the symbol string for that. What word must we add to ask this question? Why?

2. Yes or no _____ + _____ + _____ + _____ + _____ + (Man)
Did Hortense eat the halibut hurriedly?

What symbol shows the object replacement?

object $\Longrightarrow$ wh + NP^2

To show that how is the question-word in this transformation, linguists again use the wh part of the replacement symbol. What would they logically attach wh to show that how replaces a manner adverbial? wh + Man then becomes the symbol for the question-asking word how in the manner adverbial transformation.

The third step is to write the how question and its string of symbols. What does how replace? What symbol does wh + Man replace? Where does this element now appear in the string in the question? What transformation draws it to the beginning?

3. How question

wh + Man + past + do + NP + verb + NP^2

How did Hortense eat the halibut?

Exercise 9:
Rewrite these kernel sentences 1) as yes or no question, and 2) as how questions.

Example:

The teenagers washed the dishes reluctantly. $\Longrightarrow$
Did the teenagers wash the dishes reluctantly? $\Longrightarrow$
*Did the teenagers wash the dishes how $\Longrightarrow$ How did the teenagers wash the dishes?

1. The librarian worked quietly. $\Longrightarrow$
2. Clarice will construct the diagram carefully $\Longrightarrow$
3. The gardner has pruned the roses severely. $\Longrightarrow$
4. Paul tries hard. $\Longrightarrow$
5. You should speak politely. $\Longrightarrow$
6. Minerva had approached the spider cautiously. $\Longrightarrow$
7. Linus surrendered the blanket sorrowfully. $\Longrightarrow$
8. The balloon burst noisily. $\Longrightarrow$
9. The child was neglected carelessly. $\Longrightarrow$
10. The runner was gaining steadily. $\Longrightarrow$

Exercise 10:
Construct symbol strings for any five of the how question transfcrmations you have written in the preceding exercise.

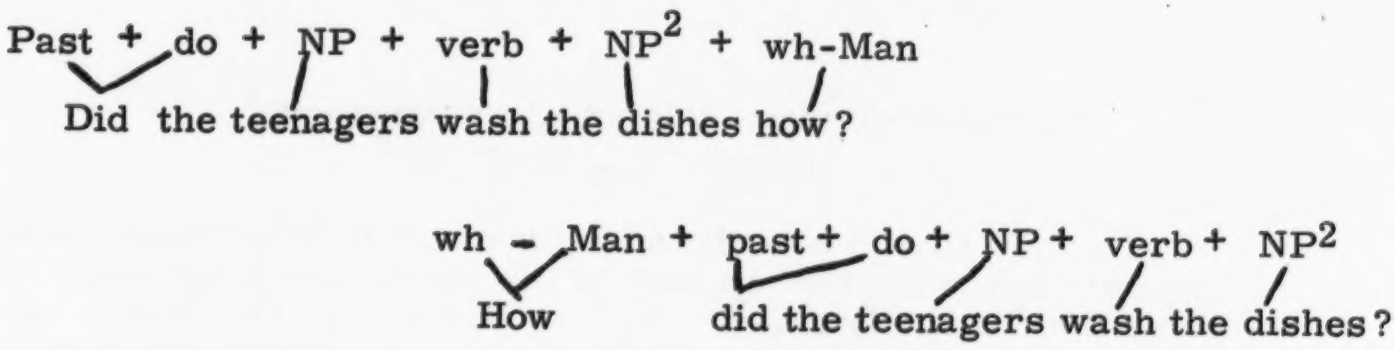
Example:

NP + past + verb + NP^2 + Man

The teenagers washed the dishes reluctantly. $\Longrightarrow$

Past + do + NP + verb + NP^2 + Man

Did the teenagers wash the dishes reluctantly? $\Longrightarrow$


Past + do + NP + verb + NP2 + wh-Man
Did the teenagers wash the dishes how?
wh - Man + past + do + NP + verb + NP2
How did the teenagers wash the dishes?

Exercise 11:
Write five sentences of your own containing manner adverbs. Transform each sentence 1) into a yes or no question, and 2) into a how question. Remember that there are two steps involved here: attaching wh to the manner adverb and drawing wh-Man to the beginning.

How can we show that either an NP^2 or a Man may have wh attached? We can add the symbol Man to $T_{wh\text{-}attachment}$:

$$T_{wh\text{-}attachment}: \begin{Bmatrix} NP_2 \\ Man \end{Bmatrix} \Rightarrow wh + \begin{Bmatrix} NP^2 \\ Man \end{Bmatrix}$$

when NP_2 or Man is in a string which has gone through TQ.

When a NP^2 or Man has wh attached, what other transformation must be applied?

What other kind of adverbial did our phrase structure rules include? In studying be and Vlnk, we found that Pr may sometimes be an adverbial. What test do you use to find the kind of Pr in this sentence?

The ship was at anchor.

As you may remember, the simple test was to transform the sentence into a question by using where in place of Pr.

The ship was at anchor
Where was the ship?

What symbol did we give this subclass of Pr? Because at anchor completes the sentence and answers the question we called it a locative adverb and adopted the symbol Loc to stand for it. Where else did we find Loc in our kernel sentence? What kinds of verb may it be used with?

Exercise 12:

A. Rewrite the following sentences as where questions.

Example: He stayed home ⟹ Where did he stay?

1. The doctor has been here. ⟹
2. She might have been away yesterday. ⟹
3. Jack stayed upstairs. ⟹
4. The principal was out. ⟹
5. He can remain there. ⟹
6. The fire must have been nearby. ⟹
7. He built a fire on the hearth. ⟹
8. He ran quickly to town. ⟹
9. Jack sings in the bathtub. ⟹
10. We took our books to the library. ⟹

B. Write 5 sentences which can be converted to where questions.

What did you replace with where in this transformation? What position does the asking word have in this adverb of location transformation?

By now you may have noted a similarity in the last three question transformations. To construct the object replacement or How question we used the yes or no question to build on.

Replacement of object:

		Eddie earned the money ⟹
	Did	Eddie earn the money ⟹
What	did	Eddie earn?

Manner adverbial:

		Eddie earned the money easily ⟹
	Did	Eddie earn the money easily. ⟹
How	did	Eddie earn the money?

Does the Loc question transformation seem to grow out of another question? What step is missing here?

	He stayed home ⟹
Where did	he stay? ⟹

Again, the kernel sentence must be changed into the word order of the yes or no question before the where question word can be substituted.

		He stayed home.
	Did	he stay home? ⟹
Where	did	he stay? ⟹

Thus far our question symbols have been

object - wh + NP^2
Manner - wh + Man

What is the logical symbol for the question-word where when it replaces Loc? We will use wh + Loc.

The symbol string which underlies the Loc question is similar to other question transformations.

Kernel

NP + tns + verb + Loc

He stayed home. ⟹

Yes or no

Tns + do + NP + verb + Loc

Did he stay home? ⟹

wh-attachment

Tns + do + NP^1 + verb + wh-Loc

Did he stay where?

Loc question

wh + Loc + tns + do + NP + verb

Where did he stay ?

Exercise 13:

A. Transform these sentences into (1) yes or no questions, (2) add wh, (3) then transform them into Loc questions. Finally write the underlying symbol strings.

1. The doctor has been here. ⟹
2. She might have been away yesterday ⟹
3. Jack stayed upstairs. ⟹
4. The principal was out. ⟹
5. He can remain there. ⟹
6. The fire must have been near. ⟹

B. Write the underlying yes or no question and then the kernel sentence for the following Loc questions.

1. Where have you put the bucket?
2. Where does the water go?
3. Where were the doughnuts?
4. Where are the fish biting?
5. Where did the rainbow appear?

How would you write the rule for this transformation? Remember that the operation is similar to that used in the How question. In that rule we wrote how as Wh + Man and placed it first in the question. In the rule for the Loc question what will be the first element in the string? What must a kernel sentence have in order to transform into a where question? How will you show the part not involved in the transformation?

In the Loc question, just as in the replacement of object and the manner adverbial question we attached wh to the element being questioned. How can we change the rule which describes the wh-attachment to include wh-Loc? Remember that it also includes NP^2 and Man. What transformation must the string have gone through before the wh attachment applies? How will we show that whenever NP^2, or Man, or Loc appear in a string the wh may attach to any of them? To put this all in a rule we can write:

$T_{wh\text{-attachment}}$

$$\ldots \quad \left\{ \begin{matrix} NP^2 \\ Man \\ Loc \end{matrix} \right\} \Rightarrow \ldots \text{ wh-} \left\{ \begin{matrix} NP^2 \\ Man \\ Loc \end{matrix} \right\} \ldots$$

where NP^2, Man, or Loc is in a string which has gone through T_Q.

So far, our question transformations have included yes or no questions, replacement of object, and replacement of manner and locative adverbs. Besides Loc, what kind of adverbial did we add when we expanded phrase structure rule (2)? Why did we add it to Rule (2)? What symbol did we use to indicate this kind of adverbial? What question word does a time adverbial answer?

Exercise 14:
Rewrite the following sentences as when questions.

Example:
Herbert answered the letter yesterday
When did Herbert answer the letter? ⟹

1. We will meet before lunch ⟹
2. The students issue the school paper monthly ⟹
3. Dolly withdrew her name early. ⟹
4. They will be vacationing abroad this summer. ⟹
5. Kern became captain a week ago. ⟹
6. You should do it now. ⟹
7. The plane must have vanished last night. ⟹

In what ways is the Tm question transformation similar to other question transformations? Does the Tm transformation grow out of another question? What happens to the word order before the time question-word can be substituted? Where does the question word appear in the transformation? What is a logical symbol for the question-word when which replaces Tm in the transformation?

How can we change T_{wh} attachment to include wh-Tm? Remember that so far our rule indicates that whenever an NP^2, a Man, or a Loc occur in a string which has already gone through the yes-or-no transformation (T_Q) we can attache wh to them and they then become question words. If we add Tm we will have:

T_{wh} attachment $\left\{\begin{matrix}NP^2\\Man\\Loc\\Tm\end{matrix}\right\} \Rightarrow$ wh-$\left\{\begin{matrix}NP^2\\Man\\Loc\\Tm\end{matrix}\right\}$ when NP^2, Man, Loc, and Tm are in sentences which have gone through TQ.

You know, of course, that

wh-NP^2	becomes what or whom
wh-Man	becomes how
wh-Loc	becomes where

What does wh-Tm become?

Exercise 15:
A. Show the three steps involved in writing Tm questions by transforming the following into 1) yes or no questions, 2) adding wh, and 3) then transforming them into Tm questions. Write the underlying symbol strings for each step.

Example:

Kernel
NP + tns + verb + NP + Tm

Herbert answered the letter yesterday. ⟹

Yes or no question
Tns + do + NP + verb + NP + Tm

Did Herbert answer the question yesterday ⟹

wh-attachment
Tns + do + NP + verb + NP + wh + Tm

*Did Herbert answer the question when.

Tm question
wh + tm + tns + do + NP + verb + NP

When did Herbert answer the letter?

1. Davie ran a mile last night.
2. We will finish the work in the morning.
3. Skidmore caught thirty mice last month.
4. Philip has been picking beans all day.
5. The captain is meeting us at three o'clock.

B. Give the underlying sentences for the following when questions. Remember that it took two steps to get from the kernel to the when question. You will have to provide a suitable word for when in the underlying sentence. What kind of word will it be?

Example:

When did you get your grades?

Yes or no question: Did you get your grades yesterday?

Kernel: You got your grades yesterday.

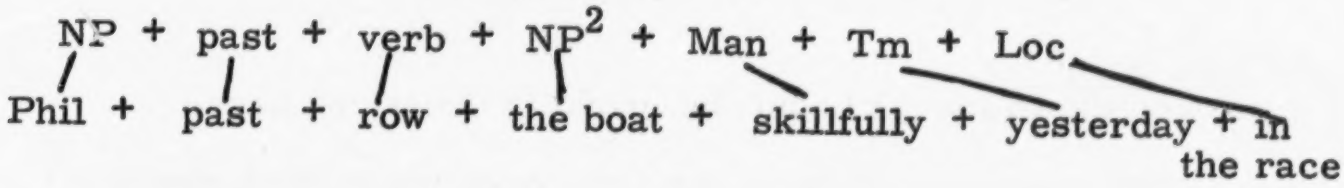
1. **When will Steve return?**
2. **When did you see Mary?**
3. **When were the Kimballs coming?**
4. **When are you finishing the course?**
5. **When has he called his mother?**

The Subject Replacement Question

We have been discovering that a great many different kinds of questions are all basically related. In what way are the following related?

1. Did Phil row the canoe skillfully yesterday in the race?
2. What did Phil row skillfully yesterday in the race?
3. How did Phil row the boat yesterday in the race?
4. Where did Phil row the boat yesterday?
5. When did Phil row the boat skillfully in the race?

In what way are the last four related to each other? What is the basic underlying kernel sentence string which has been transformed to produce all of these questions? Written with its symbols attached it would look like this:



Since we have discovered that many questions are the result of first going through the yes-or-no question transformation (which we called T_Q) and then the transformations which attach wh to one of the parts of the sentence and move it to the front of the sentence, do you begin to wonder if all questions can be accounted for in this way?

When scientists begin to see a pattern in the way certain things operate they make a generalization describing the operation. This is sometimes called a hypothesis. Then the scientists test the hypothesis by applying it to other situations which they think it might explain. Language scientists do the same thing. They observe the way we put words together and when they begin to see a pattern they make a generalization, which is really a rule--like T_Q. They then test the rule by applying it to other sentences.

We have observed that yes-or-no questions, object replacement questions, how questions, and time and place questions can all be described as the result of the same transformations operating on one basic kernel sentence string. Are there any questions which we have not accounted for yet? Look at the following groups of questions to see if there are any which are not covered by the rules we have written so far.

1. Is the class holding the dance in the auditorium?
   Where is the class holding the dance?
   Who is holding the dance in the auditorium?

2. Will the team arrive on time?
   When will the team arrive?
   What will arrive on time?

3. Has the girl made the refreshments?
   What has the girl made?
   Who has made the refreshments?

4. Did Joe answer the questions honestly?
   How did Joe answer the question?
   Who answered the question honestly?

Class Exercise:
Answer the following about the group of questions above.

1. What kind of question is the first question in each group?
2. What is the kernel sentence which has been transformed to produce the first question in each group?
3. Is the first question related to the second? In what way?
4. In each group a word in the first question appears as a question word in the second. What word in the second sentence of each group asks the question?
5. What word has it replaced in the first sentence?
6. What do we call this kind of transformation?
7. Where does the question word finally appear in the new question?

The exercise above emphasized the process by which questions 1 and 2 are derived. What can we say about the 3rd question in each group? Do you think that it is related to the other two? Can it be accounted for in the same way? To answer this question we will first write the kernel sentence strings which underlie the first 2 questions of each group. What word in the 3rd sentence asks the question? What word in the first has been replaced by the question word? Would it be accurate to call this the subject question? Is the word that replaces the subject always the same word? Why is it what in Group 2? When we talked about the object replacement questions, you remember, we said that whom replaced human nouns and what replaced non-human nouns. This is also true of the subject replacement. But we must also remember that who is the form for the subject NP whereas whom is the form for the object NP.

To find out if the subject replacement question is produced like the others we will first write the kernel sentence strings which underlie the first 2 questions of each group. Then we will apply the wh attachment and the T_{wh} to the subject NP and see if we end up with the subject question. In this way we will be testing the hypothesis that all questions are basically related and can be accounted for by the same process.

Group 1.

The underlying kernel string

NP + pres + be + ing + verb + NP^2 + Loc ⟹

The class is holding the dance in the auditorium.

T_Q (yes or no transformation)

pres + be + NP^1 + ing + verb + NP^2 + Loc ⟹

Is the class holding the dance in the auditorium?

wh-attachment (to NP^1)

pres + be + wh-NP^1 + ing + verb + NP^2 + Loc ⟹

*Is who holding the dance in the auditorium?

T_{wh}

wh-NP^1 + pres + be + ing + verb + NP^2 + Loc

Who is holding the dance in the auditorium?

Group 2.

The underlying kernel string

NP^1 + pres + M + verb + Tm

The team will arrive on time. ⟹

T_Q (yes or no transformation)

pres + M + NP^1 + verb + Tm

Will the team arrive on time? ⟹

wh-attachment (to NP^1)

pres + M + wh-NP^1 + verb + Tm

*Will who arrive on time? ⟹

T_{wh}

wh-NP^1 + pres + M + verb + Tm

Who will arrive on time?

Group 3.

The underlying kernel string

NP^1 + pres + have + en + verb + NP^2

The girl has made the refreshments. ⟹

T_Q (yes or no transformation)

pres + have + NP^1 + en + verb + NP^2

Has the girl made the refreshments? ⟹

wh-attachment (to NP^1)

pres + have + wh-NP^1 + en + verb + NP^2

*Has who made the refreshments? ⟹

T_{wh}

wh-NP^1 + pres + have + en + verb + NP^2

Who has made the refreshments?

Have we so far been able to produce the subject questions by applying the same rules by which we produced the others? Now let's see what happens when we have an underlying string like the one for Group 4.

Group 4.

The underlying kernel string.

NP^1 + past + verb + NP^2 + Man ⟹

Joe answered the question honestly.

When we apply T_Q what do we get? Remember that if the sentence has neither M, have, or be before the verb, Tns moves by itself.

T_Q (yes or no transformation)

past + ____ + NP^1 + verb + NP^2 + Man

Since Tns does not attach to NP what is it necessary to do to produce a grammatical sentence? Suppose we try at this point to add do. What do we get?

past + do + NP^1 + verb + NP^2 + Man ⟹

Did Joe answer the question honestly?

Now we will apply the wh-attachment transformation.

past + do + wh-NP^1 + verb + NP + Man ⟹

*Did who answer the question honestly?

And finally we apply T_{wh} which pulls the question word to the beginning.

wh-NP^1 + past + do + verb + NP^2 + Man

Who did answer the question honestly?

Is this the subject question from group 4 which we have been trying to produce? Under what circumstance might you want to say "Who did answer the question honestly?" The subject question we were trying to produce did not require do. Is this a case where our rules which we have applied so successfully up to this point, break down? Or is there some other explanation? How can we avoid do in the final question?

Suppose, instead of automatically adding do to tense right after the yes-or-no transformation, we apply the other transformations first. That gives us

T_Q

past + _____ NP + verb + NP^2 + Man

*past Joe answer the question honestly.

wh-attachment

past + _____ wh-NP^1 + verb + NP^2 + Man

*past who answer the question honestly?

T_{wh}

wh-NP^1 + past + verb + NP^2 + Man

Who answered the question honestly?

We have now arrived at the subject question we were trying to produce. Is it necessary to add do? Why? If we put off adding do until we have finished the other transformations we discover that it isn't needed and we can account for the subject question in exactly the same way we have accounted for all the others. So our hypothesis that all questions are basically related still holds.

We must now add wh-NP^1 to our T_{wh} attachment rule:

T_{wh} attachment:

$$\left\{\begin{matrix} NP^1 \\ NP^2 \\ Man \\ Loc \\ Tm \end{matrix}\right\} \Longrightarrow \text{wh-} \left\{\begin{matrix} NP^1_2 \\ NP^2 \\ Man \\ Loc \\ Tm \end{matrix}\right\}$$

When any of these elements are in a sentence which has gone through T_Q

Exercise 16:
Copy the following kernel sentences and transform them into subject questions by applying first the yes-or-no transformation (T_Q) and then wh-attachment and finally T_{wh} (which draws the question word to the front of the sentence).
Write symbol strings for the kernels and the questions.

Example: Fritz had drunk the milk.

Kernel sentence

NP + past + have + en + verb + NP^2
Fritz had drunk the milk.

T_Q (yes-or-no)

past + have + NP + en + verb + NP^2
Had Fritz drunk the milk ?

wh-attachment

past + have + wh-NP + en + verb + NP^2
Had who drunk the milk?

T_{wh}

wh-NP + past + have + en + verb + NP^2
Who had drunk the milk.

1. Mr. Trask witnessed the accident.
2. The ball hit the child.
3. The puppy mutilated the pie.
4. The president should have named the committee.
5. The teacher will dictate the questions.
6. A piano is blocking the doorway.
7. Dictators must be careful.
8. Melissa has been sweeping the kitchen.
9. The room is getting noisy.
10. The Robert E. Lee won the race.

Questions for Review

1. What do question transformations do?
2. What changes are made in the word order in forming a yes-or-no question? What is this transformation called?
3. What happens in the yes-or-no transformation if the verb is Be?
4. What happens if there is neither M, have, be, or the Verb Be in the sentence?
5. What three transformations occur in producing the object replacement question?
6. What is meant by wh-attachment?
7. What does wh mean?
8. What is the T_{wh} transformation?
9. How is the How question formed? The time question? The place question? The subject replacement question?
10. How are all questions related?

Exercise for review:
Construct sentences for the following symbol strings. You will notice they are strings of transformed sentences.

Example: Tns + do + NP + verb + NP^2 + Tm

Did you see the game last night?

A. 1. Wh + Tm + tns + do + NP + Vtr + NP^2
2. Wh + Loc + tns + be + NP
3. Tns + M + NP + have + en + Vmid + NP^2
4. Wh + Man + tns + do + NP + Vtr + NP^2
5. Wh + NP + tns + Vin + Man
6. Wh + NP^2 + tns + M + NP + Vtr
7. Tns + be + NP + Pr

B. 1. Wh + Tm + tns + M + NP + Vlnk + Pr
2. Wh + NP + tns + be + Pr
3. Tns + do + NP + Vmid + NP^2
4. Tns + be + NP + ing + Vtr + NP^2
5. Tns + have + NP + en + Vtr + NP^2
6. Wh + NP + tns + have + en + Vtr + NP^2

Exercise for review:

Transform each sentence below into the kind of question asked for in the parenthesis. Remember that some questions require several transformations. Construct strings of symbols which underlie each transformation.

Example 1:

Janice swallowed the butterfly (yes or no)

NP + past + verb + NP^2

Janice swallowed the butterfly. ⟹

T_Q (yes or no)

past + (do) + NP + verb + NP^2

Did Janice swallow the butterfly?

(It was necessary to add do so that past could attach to something)

Example 2:

Clyde climbs the stairs painfully (How question)

NP + pres + vrb + NP^2 + Man

Clyde climbs the stairs painfully. ⟹

T_Q

pres + (do) NP + vrb + NP^2 Man

Does Clyde climb the stairs painfully. ⟹

wh-attachment

pres + (do) + NP + vrb + NP^2 wh-Man

*Does Clyde climb the stairs how? ⟹

T_{wh}

wh-Man + pres + (do) + NP + vrb + NP^2

How does Clyde climb the stairs?

A. 1. Beatrice was wearing jeans. (yes or no)
2. The professor had returned the exams yesterday (yes or no)
3. The children stayed indoors. (Loc)
4. The pygmy bought a toothbrush. (object replacement)
5. The inmate ate the soup noisily. (How)
6. The choir can sing beautifully. (How)
7. The boys will ride to the coast next week. (Tm)
8. Mother should join the PTA. (object replacement)
9. The lambs had been gamboling happily. (How)
10. The lawn has been drying badly. (yes or no)
11. Frankie speaks French fluently. (How)
12. The basket is there. (Loc)

B. 1. Katy was drinking her milk. (subject replacement)
2. The children stayed indoors. (subject replacement)
3. The boomerang hit the tree forcefully. (object replacement)
4. Prudence appeared on the stage. (Loc)
5. Chaucer lived in the fourteenth century. (Tm)
6. Grandfather could have remained outside. (Loc)
7. Peter will give money for the billfold. (object replacement)
8. Helen will have dinner in the Spaceneedle. (subject replacement)
9. The strikers paced steadily up and down. (Man)